



Agronomic and Economic Improvement in Smallholder Cassava Farmers in NTT

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Introduction

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Background and Past Research

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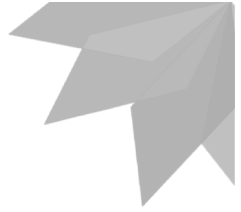
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Background and Past Research



Smallholder Cassava Farmers in NTT



- Planting Period: October (early raining season) – January (late raining season)
- Harvesting Period: November (9-10 months) however, most of the local varieties is being harvest more than 1 year (in some cases up until 2 years)
- Cassava mainly used as food source, and as animal feedstock
- Price at the local market (for food) IDR 7,500-10,000 per kg (USD 0.75/kg)
- Most of the farmers keep the cassava as emergency food source
- Price for animal feedstock varied between IDR 1,500-2,000 per kg



Problems in smallholder cassava farmers



01

Low yield

Cassava yield is very low (5 – 10 t/ha), mainly because of low plant density (planting space 4m x 2m)

02

Low input

Farmers in NTT are planting cassava intercrop with other main crops (maize, upland rice). Most of farmers do not apply fertilizer to the cassava, only to the main crop

03

Market uncertainty

Farmers are hesitant to planting more cassava because afraid there will be no market (trader/industry)

04

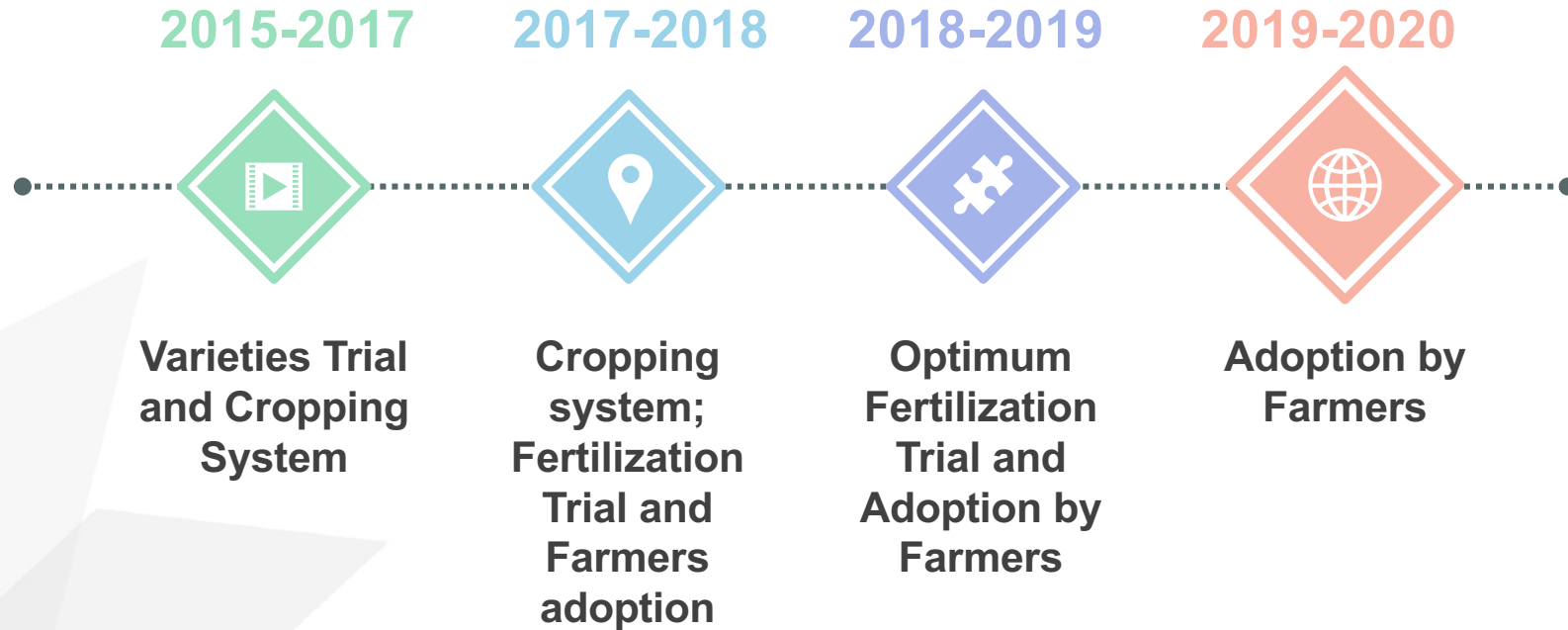
Low starch varieties

Farmers mainly planting the low starch cassava varieties, hence it is not preferable to the tapioca industry (Mr Tomi)



Past Research

Cassava value chain in smallholder cassava farmers in NTT



2016 Results

Varieties Trial

Cassava varieties	Number of Tuber per plant	Tuber wgt (kg.plant ⁻¹)
Sika Putih (Local)	4.86 ± 1.14	2.80 ± 0.52
Sika Kuning (Local)	4.75 ± 1.03	2.74 ± 0.66
Mentega	9.85 ± 2.67	5.06 ± 0.46
Tambak Udang	11.0 ± 2.19	5.57 ± 0.57
Faroka	9.75 ± 1.28	5.12 ± 0.84
UB ½	7.72 ± 1.80	4.22 ± 0.45
UB 1472	7.15 ± 1.08	4.31 ± 0.49
Gajah	10.08 ± 2.82	6.85 ± 1.20



Variety trials, 10 months



Gajah

Region	Lowland	Upland	Total
Have you ever grown intercroops with your cassava?	100%	96%	98%
Do you currently grow any intercroops with your cassava?	100%	100%	99.08%
Are you interested in trialling new intercroops?	70.69%	75.00%	72.73%

2017 Results

Varieties Trial

Cassava Varieties	Field Trial		Farmers Field	
	Mealy Bugs (%)	Yield (ton.ha ⁻¹)	Mealy Bugs (%)	Yield (ton.ha ⁻¹)
Sika Putih	20	25.7	-	-
Sika Kuning	25	26.6	-	-
Adira 1	41	31.2	100	29.4
Tambak Udang	65	32.5	100	28.2
Faroka	50	36.8	100	34.7
UB 1/2	52	34.8	100	34.2
UB 4472	39	33.6	100	35.7
Malang 6	35	45.7	-	-
Gajah	54	38.5	100	35.2



During the field day, farmers were invited to see the results of varieties trial, and were asked the preference of selected varieties. The Malang 6 and Gajah were the most preferable by the farmers

2017 Results

Cropping System Trial



Cassava intercropping

Maize

Peanut

(Cassava planting
space 1m x 1m)

Mung Bean

(Cassava planting
space 1m x 1m)

Local System

(Cassava planting
space 3m x 1m)

Introduction System

(Cassava planting
space 1m x 1m)



2017 Results



Cropping System Trial

Cropping System	Grain weight/cob (kg)	Yield (ton/ha)
Maize Monoculture	99.46	3.94
Intercropping Maize-Cassava Local system	102.34	4.05
Intercropping Maize-Cassava Introduction	109.24	4.32

Cropping System	Plant Biomass (t/ha)	Cassava Yield (t/ha)
Cassava monoculture	32.78	33.19
Cassava + maize (local system)	13.17	10.04
Cassava + maize (Intro system)	20.45	24.78
Cassava + peanut	36.78	27.08
Cassava + mungbean	35.55	26.28

During the field day, farmers were invited to see the results of cropping system trial. Farmers were convinced that planting cassava in denser planting space will not inhibit the maize yield; and resulted in higher cassava yield

2017-2018 Farmers Adoption



Village	Number of Farmer Participate
Bloro (Upland area)	4 Farmers @ 0.5 ha
Tebuk (Upland area)	8 Farmers @ 0.25 ha
Wolohuler (Upland area)	8 Farmers @ 0.25 ha
Langir (Lowland area)	6 Farmers @ 0.25 ha



2017-2018 Farmers Adoption



Name	Yield (ton/ha)					
	Gajah	Faroka	Local	Malang 4	Tambak	Maize
Ignasius	38.25	24.75	12.4			6
Mateus	35.55	30.52	23.46	46.45		4
Rubensia	20.81		12.93			
Agustina	39.37		18			
Zakarias	50.4					
Agustina	35.62	28.65			25.65	
Leong		26.87				
Antonius	34.84	23.62	16.31			6
Rubensia	40.5	23.62				6
Korina			21.6	46.7		5



Farmers were adopting the cropping system (Intercropping maize-cassava) with cassava planting space 2m x 1m
Farmers also were applying fertilizer:
300 kg/ha NPK (15/15/15) in the beginning of planting
200 kg/ha Urea after harvesting maize



Activities 2017-2019



2017-2018 Fertilization Trial



Region	Lowland	Upland	Total
Do you apply organic fertilizer to your cassava?	13.56%	28.85%	20.72%
Do you apply inorganic fertilizer to your cassava?	55.93%	43.40%	50.00%
Do you understand what the NPK values mean on the fertilizer you apply?	27.12%	26.92%	27.03%
Have you ever seen a fertilizer trial on cassava?	5.08%	9.62%	7.21%
Are you interested in visiting a fertilizer demonstration trial to see the result on production and returns?	88.14%	83.02%	85.71%
Are you interested in conducting a trial on your own land?	84.75%	81.13%	83.02%

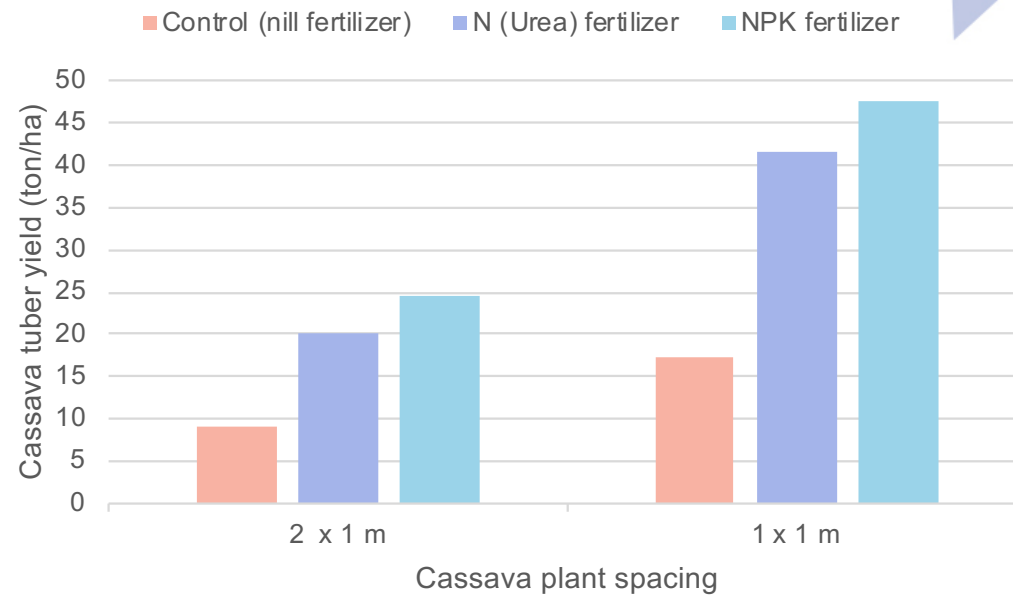
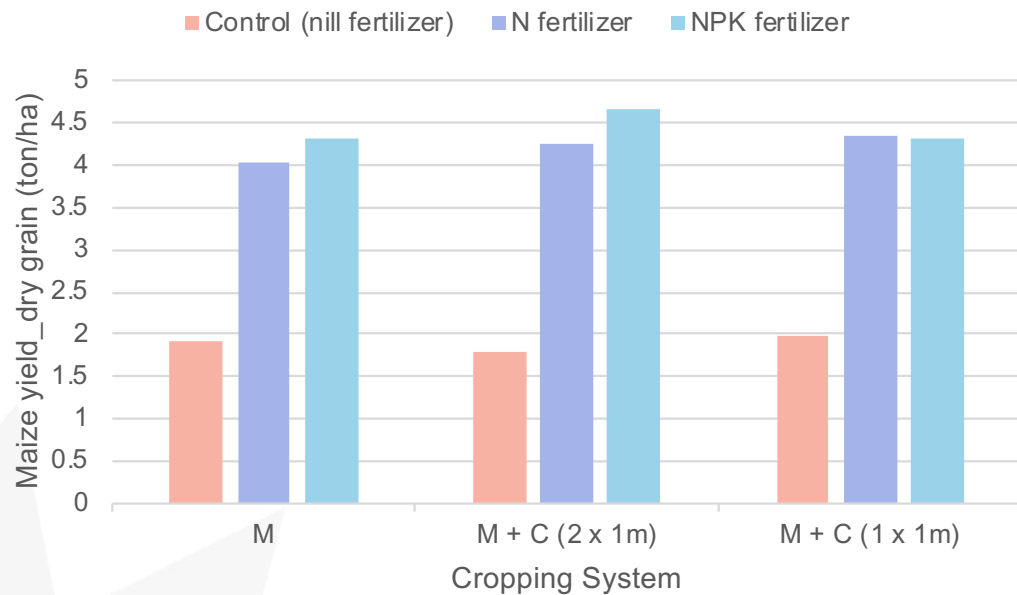
Farmers were mostly applying fertilizer only for the main crops in the intercropping, but only few farmers applying fertilizer for the cassava

2017-2018 Fertilization Trial



Code	Cropping System	Fertilizer
MF0	Maize Monoculture	Nil Fertilizer (control)
MN	Maize Monoculture	200 kg Urea (1 st at planting; 2 nd at 45 days after planting, dap)
MNPK	Maize Monoculture	200 kg Urea/ha (1 st at planting; 2 nd at 45 dap); 100 kg Superphosphate 36 (SP36) and 100 kg Potassium chloride (KCl) at planting
MC ₁ F0	Intercropping Maize-Cassava (2m x 1m)	Nil Fertilizer
MC ₁ N	Intercropping Maize-Cassava (2m x 1m)	300 kg Urea/ha (1 st at planting; 2 nd at 45 dap; 3 rd after maize harvested).
MC ₁ NPK	Intercropping Maize-Cassava (2m x 1m)	300 kg Urea/ha (1 st at planting; 2 nd at 45 dap; 3 rd after maize harvested). 100 kg SP 36 and 100 kg Potassium KCl at planting.
MC ₂ F0	Intercropping Maize-Cassava (1m x 1m)	Nil Fertilizer
MC ₂ N	Intercropping Maize-Cassava (1m x 1m)	300 kg Urea/ha (1 st at planting; 2 nd at 45 dap; 3 rd after maize harvested).
MC ₂ NPK	Intercropping Maize-Cassava (1m x 1m)	300 kg Urea/ha (1 st at planting; 2 nd at 45 dap; 3 rd after maize harvested). 100 kg SP36 36 and 100 kg KCl at planting.

2017-2018 Fertilization Trial



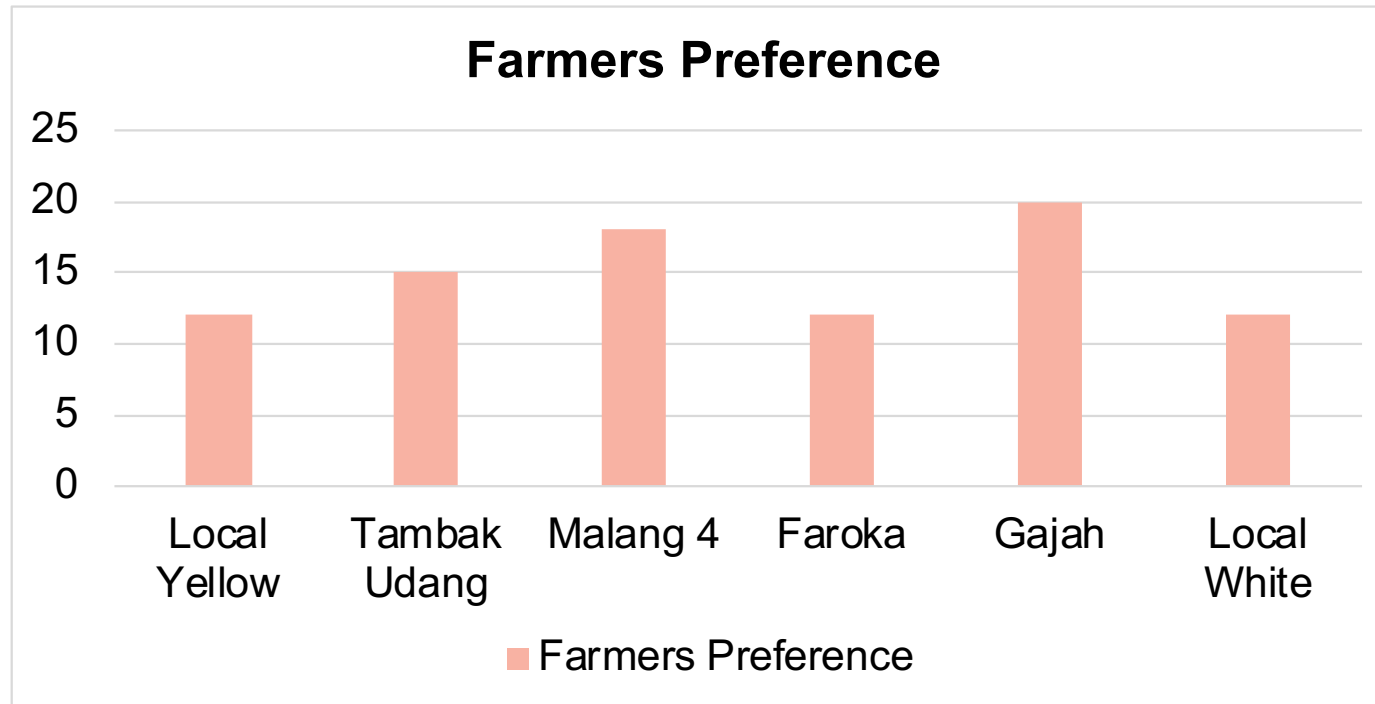
2017-2018 Varieties Trial in East Flores



Variety	Cassava Yield(ton/ha)				
	Rep. I	Rep. II	Rep. III	Total	Average
Malang 4	45.35	59.48	54.55	159.38	53.12
Faroka	42.28	55.42	41.61	139.31	46.43
TambakUdang	35.73	47.55	39.44	122.72	40.90
Gajah	44.02	46.20	56.00	146.22	48.74
Local White	21.69	32.58	31.70	85.97	28.65
Local Yellow	31.06	35.25	40.93	107.24	35.64



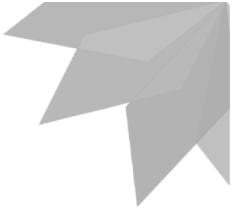
2017-2018 Varieties Trial in East Flores



Farmers preference were based on the yield of cassava (kg/plant) and the taste of Cassava



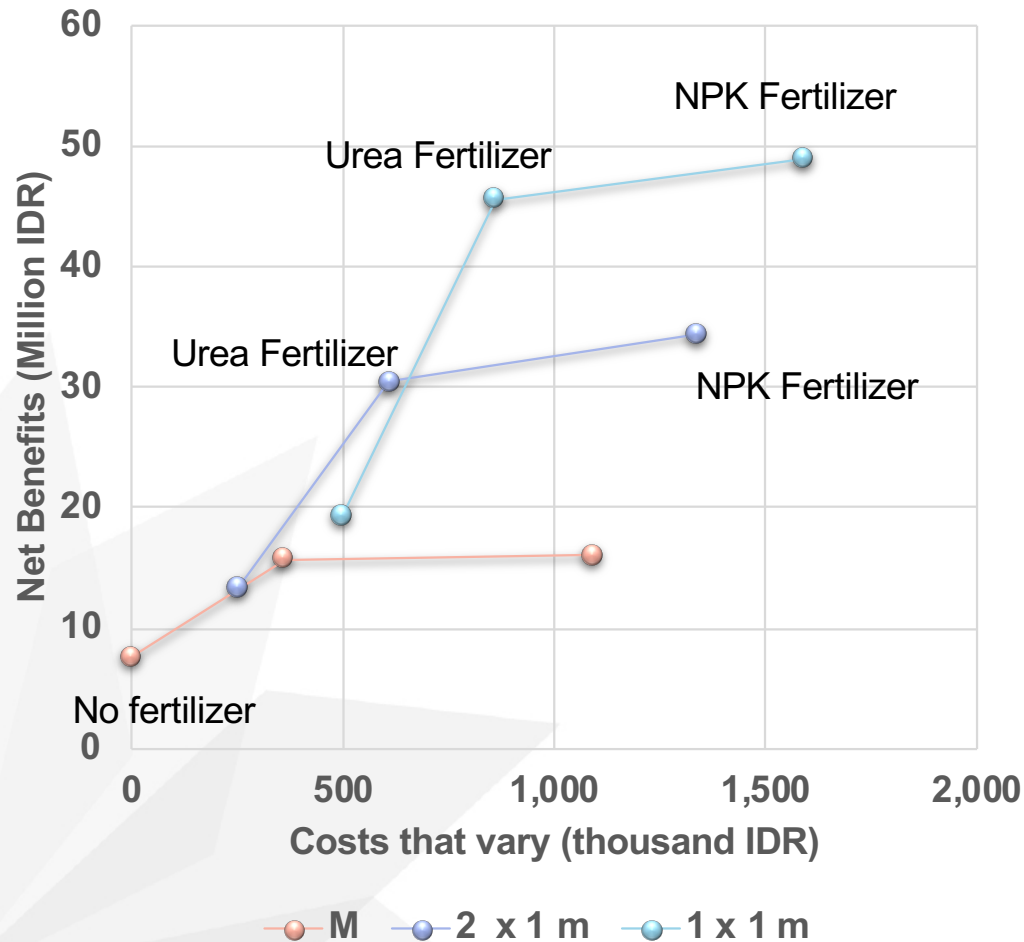
Economic Analysis



2017-2018 Fertilization Trial



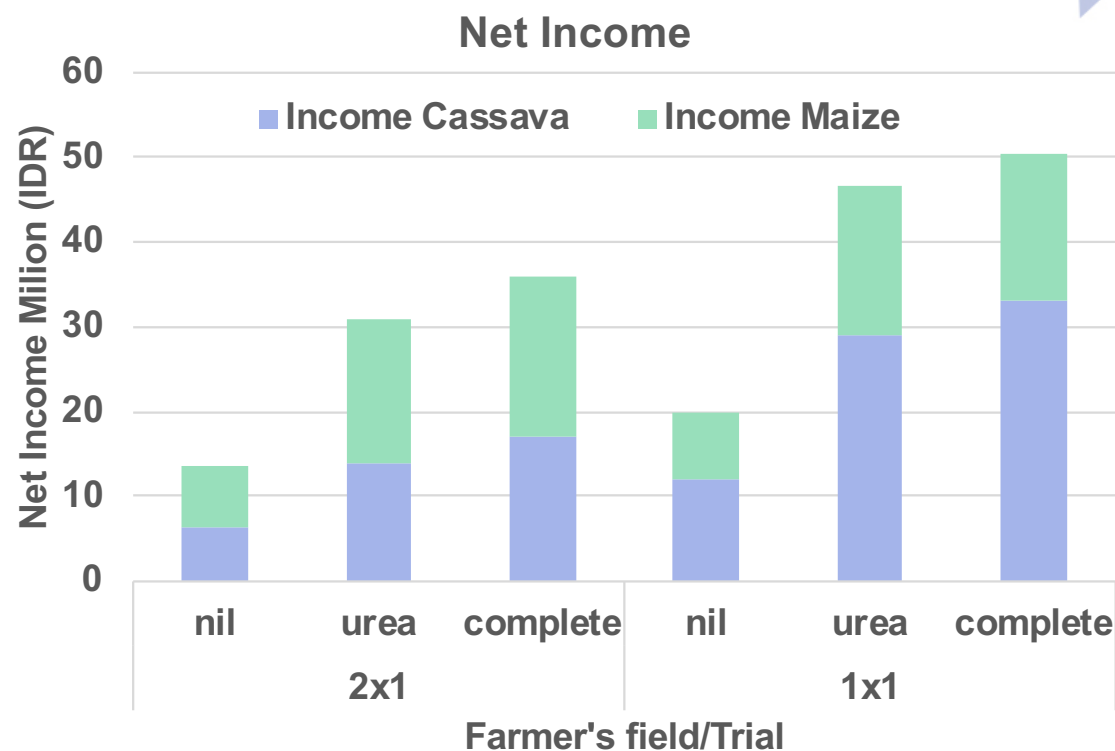
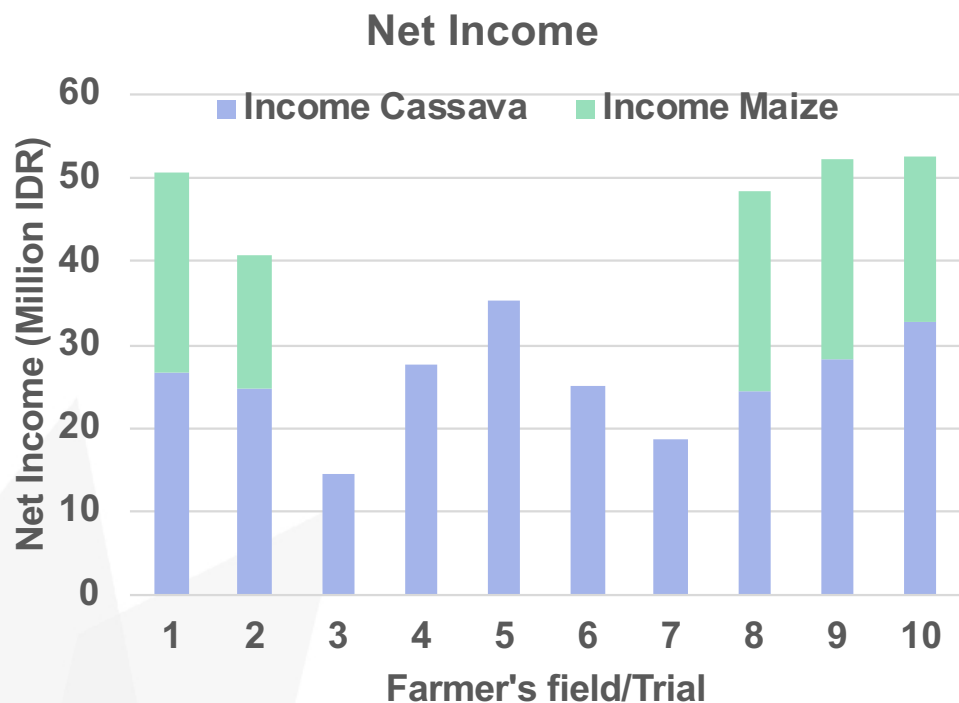
Marginal Rate of Return (MMR)



	NET BENEFITS (000 IDR)				MRR SPACING	
	Mono	2x1	1x1		2x1	1x1
0	7,640	13,254	19,406	0	2246%	2461%
N	15,760	30,413	45,658	N	5861%	6098%
NPK	16,110	34,410	48,940	NPK	7320%	5812%
	MRR FERTILISER					
N	2256%	4766%	7292%			
NPK	48%	548%	450%			



2017-2018 Farmers Adoption vs Fertilization Trial



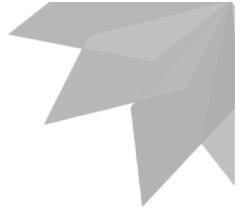
Estimated with price of cassava IDR 700/kg, and price of maize IDR 4,000/kg
Farmers were applied Urea (IDR 1,800/kg) at 200 kg/ha and NPK (IDR 2300/kg) at 300 kg/ha

Economic Analysis at Farmers Discussion Group at East Flores (Hokeng Village)

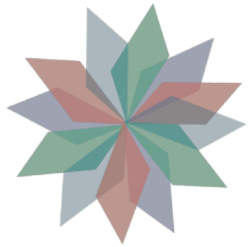


	Cassava Monoculture	Cassava Mono (USD)	Cassava- Maize	Cassava- Maize (USD)
Material costs (A)	1,110,000	\$78	1,630,000	\$115
Labour costs (B)	2,360,000	\$166	2,560,000	\$180
Total costs (A+B = C)	3,470,000	\$244	4,190,000	\$295
Focus group yields (0.8 maize + 25t cassava)				
Revenue (D)	17,500,000	\$1,232	21,500,000	\$1,514
Net returns (D-C)	14,030,000	\$988	17,310,000	\$1,219
Net returns to household resource (D-A = E)	16,390,000	\$1,154	19,870,000	\$1,399
Labour days (F)	59	59	64	64
Net returns per labour day (E/F)	277,797	\$20	310,469	\$22
Experimental yields (4t maize + 35t cassava)				
Revenue			40,500,000	\$2,852
Net returns			36,310,000	\$2,557
Net returns to household resource			38,870,000	\$2,737
Labour days			64	64
Net returns per labour day			607,344	\$43





Discussion and Implication





Variety Selection

Farmers were prefer to planting Malang 6, Malang 4 and Gajah varieties



Cropping System

Intercropping is the main cropping system due to the needs for maize/rice for food source



Fertilizer requirement

Fertilizer in NTT is controlled by the government through a Fertilization Plan (RDKK), hence farmers need to design the fertilizer requirements for the following planting season with Field Extension Officer

Discussion and Implication



Market

Farmers willing to plant more cassava as long as there are a MOU-agreement with trader/industry

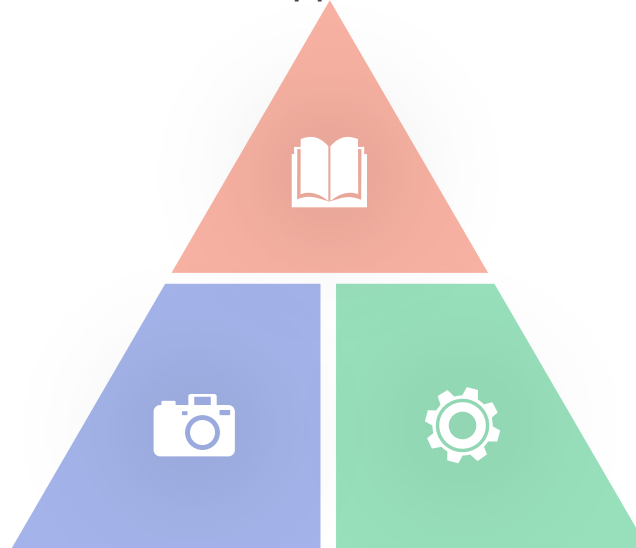




Implication

Fertilizer application

The needs for collaboration between farmers-trader/industry-field extension officer to plan the fertilizer requirement for the following planting season (moreover if cassava monoculture). Urea and NPK (15/15/15) is the most appropriate fertilizer application.



Mealy bug attack

Planting season in NTT mainly during the rainy season, thus in August (dry season) mealy bug attack is quite severe. Needs to consider treatment for mealy bug attack

Market certainty

There is a needs to formulate a formal agreement between farmers and trader/industry that address:

1. Price of cassava
2. Area of cassava planting
3. Timing of harvesting

2018-2019 Activities



- Farmers Adoption
 - Activities in Sikka and Hokeng
 - Involving 30 households (in Sikka) and 55 households (in Hokeng)
 - Mainly using Malang 4, Malang 6, Gajah varieties, but also local variety
 - Plot size varied between 0.25 ha – 0.6 ha
 - Fertilizer application : Urea 200 kg/ha and NPK 15/15/15 (300 kg/ha)
- Continue fertiliser trial (Optimum fertilizer-focus on Potassium)
 - Phosphorus applied as SP36 (36% P_2O_5) at 100 kg/ha
 - Nitrogen (45 kg N/ha; 90 kg N/ha; 180 kg N/ha)
 - Potassium (30 kg K_2O /ha; 60 kg K_2O /ha; 120 kg K_2O /ha)





Thank you